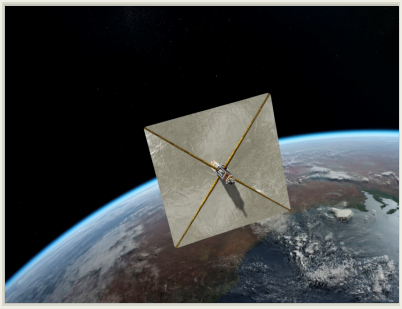
Microwave Photonic Imaging Radiometer, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Passive Microwave Remote Sensing is currently utilized by NASA, NOAA, and USGIS to conduct Earth Science missions, including weather forecasting, early warning systems, and climate studies. Due to budgetary constraints and lack of reliable access to medium-lift vehicles, the current trend in the space industry is towards smaller, cheaper, and more frequent missions. Nano-satellites, such as CubeSats, are gaining in popularity due to their low cost and ease of deployment. These miniaturized platforms impose severe constraints on the size, weight, and power (SWaP) of the payload. However, relatively large apertures are required to achieve desired spatial resolution. In this NASA SBIR effort, Phase Sensitive Innovations (PSI) will dramatically reduce the SWaP of our microwave photonic imaging radiometer technology, thus making it amenable to deployment on spaceborne platforms. Our innovative approach employs distributed aperture imaging (DAI) with optical upconversion of the incoming microwave radiation and subsequent coherent optical reconstruction of the microwave scene. The sensor features a flexible, two-dimensional form factor that allows the antenna array to be stowed for launch and deployed once in orbit using space inflatables, which enables a large RF aperture to be realized on a small platform. Besides easing implementation on small satellites, PSI?s imaging radiometer provides capabilities beyond those currently available on conventional microwave sensors, most notably the ability to generate real-time, two-dimensional radiometric imagery with no mechanical scanning. The end result of our effort will not only greatly reduce the SWaP of our instrument commensurate with deployment on emerging platforms, but also reduce the cost and complexity while increasing reliability and performance. These improvements in turn will open up new market segments for the technology.



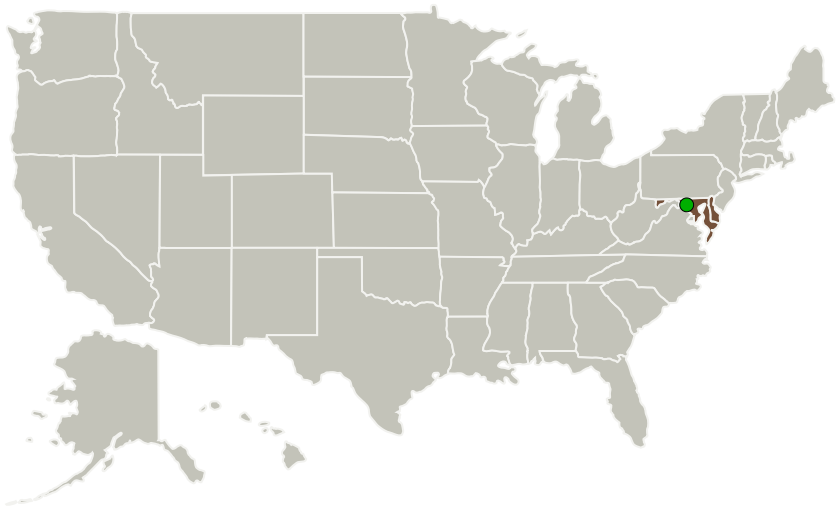
Microwave Photonic Imaging Radiometer, Phase I Briefing Chart Image

Table of Contents

Microwave Photonic Imaging Radiometer, Phase I

Completed Technology Project (2017 - 2017)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Phase Sensitive Innovations Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Newark, Delaware
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Delaware	Maryland

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Phase Sensitive Innovations Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

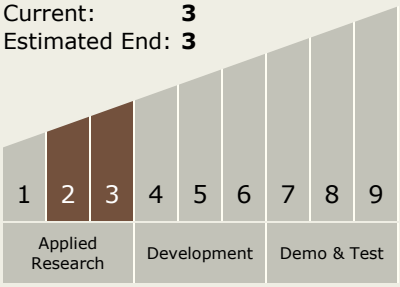
Carlos Torrez

Principal Investigator:

Thomas Dillon

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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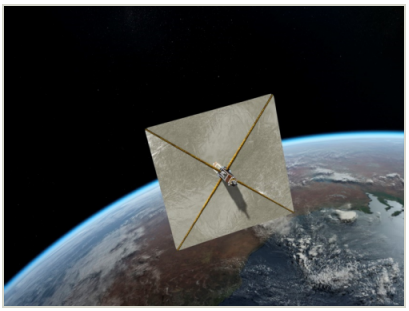
Images



Briefing Chart Image
Microwave Photonic Imaging Radiometer, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/130259)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System